CLAIMS

What is claimed is:

1. A method for selectively altering a thickness of a radiation sensitive polymer layer comprising the steps of:

providing a substrate comprising at least one radiation sensitive polymer layer having a first thickness topography;

exposing the at least one radiation sensitive polymer layer through a mask having a predetermined radiant energy transmittance distribution to selectively expose predetermined areas of the at least one sensitive polymer layer to predetermined radiant energy dosages; and,

developing the at least one radiation sensitive polymer layer to alter the first thickness topography of the at least one radiation sensitive polymer layer to produce a second thickness topography.

2. The method of claim 1, wherein the predetermined radiant energy transmittance distribution is determined according to the first thickness topography.

3. The method of claim 2, wherein the first thickness topography is determined according to one of profilometry or interferometry or scanning electron microscope.

4. The method of claim 1, wherein the step of exposing produces a differential material removal rate in the step of developing according to the predetermined radiant energy transmittance distribution.

5. The method of claim 4, wherein the step of developing comprises at least one of ablation, vaporization, self-development, baking, and chemical dissolution.

6. The method of claim 1, wherein the mask comprises subresolution features with a predetermined density distribution.

7. The method of claim 6, wherein the subresolution features comprise at least one of lines, holes and islands.

8. The method of claim 1, wherein the mask comprises semitransparent areas with a predetermined density distribution.

9. The method of claim 1, wherein the second thickness topography comprises an improved surface planarity compared to the first thickness topography.

10. The method of claim 1, wherein the substrate comprises a semiconductor wafer having a process surface comprising at least one of surface protruding and surface penetrating features.

11. The method of claim 10, wherein the surface penetrating features comprise at least one of Vias openings and trench openings.

12. The method of claim 10, wherein the surface protruding features comprise at least one of gate electrodes and metal lines.

13. The method of claim 1, wherein the step of exposing comprises at least one of alignment, stepping, and scanning.

14. The method of claim 1, wherein the step of exposing comprises at least one of a step and repeat method, a mirror projection alignment method, a proximity alignment method, a contact alignment method, and a step and stitch exposure method.

15. A method for selectively altering the thickness topography of a radiation sensitive polymer layer comprising the steps of:

providing a semiconductor wafer having a process surface comprising at least one of surface protruding and surface penetrating features;

blanket depositing a radiation sensitive polymer layer;

determining an initial thickness topography of the radiation sensitive polymer layer;

determining a desired radiant energy dosage to deliver to portions of the radiation sensitive polymer layer to selectively alter predetermined thickness portions of the radiation sensitive polymer layer in a subsequent developing process to produce a subsequent thickness topography of the radiation sensitive polymer layer;

providing an exposure mask for delivering the desired radiant energy dosage;

selectively exposing portions of the radiation sensitive polymer layer through the exposure mask to deliver the desired radiant energy dosage; and,

developing the radiation sensitive polymer layer to produce the subsequent thickness topography.

16. The method of claim 1, wherein the step of exposing produces a differential radiation sensitive polymer layer thickness change rates in the step of developing according to the desired radiant energy dosage.

17. The method of claim 15, wherein the step of developing comprises at least one of ablation, vaporization, self-development, baking, and chemical dissolution.

18. The method of claim 15, wherein the exposure mask comprises subresolution features with a predetermined density distribution.

19. The method of claim 15, wherein the exposure mask comprises semitransparent areas with a predetermined density distribution.

20. The method of claim 15, wherein the subsequent thickness topography comprises an improved surface planarity compared to the initial thickness topography.

21. The method of claim 15, wherein the surface penetrating features comprise at least one of Via openings and trench openings.

22. The method of claim 21, wherein the initial thickness topography is formed by a blanket deposition method including filling of the Vias.

23. The method of claim 22, further comprising an etchback process following formation of the subsequent thickness topography having improved planarity compared to the initial thickness topography to produce Via plugs at least partially filling the Vias.

24. The method of claim 15, wherein the radiation sensitive polymer layer comprises one of a photosensitive polymer and a photoresist.

25. The method of claim 15, wherein the steps of determining an initial thickness topography through the step of developing the radiation sensitive polymer layer are repeated.